6.2 Working With Integer Exponents

Investigate: Using patterns to evaluate powers. No decimals.
Complete the statements below and then describe the pattern.

$2^5 = 32$ ÷2
$2^4 = 16$ ÷2
$2^3 = 8$ ÷2
$2^2 = 4$ ÷2
$2^1 = 2$ ÷2
$2^0 = 1$ ÷2
$2^{-1} = 0.5$ $\frac{1}{2}$ ÷2
$2^{-2} = 0.25$ $\frac{1}{4}$ ÷2

$3^3 = 27$ ÷3
$3^2 = 9$ ÷3
$3^1 = 3$ ÷3
$3^0 = 1$ $\frac{1}{3}$ ÷3
$3^{-1} =$
$3^{-2} = \frac{1}{9}$

positive ,zero and negative exponents all follow a pattern

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note your BASE cannot be 0

Zero Exponent

In General:

$$a^0 = 1$$

$2 \div 2 = 1$, $\frac{2 \times 2 \times 2}{2 \times 2 \times 2} = 1$

$-2^0 = -1$

$3^4 \div 3^4 = 3^0 = 1$

Negative Exponent:

In General:

$$a^{-n} = \frac{1}{a^n}$$

In Words:

Invert the base and put to a positive exponent

Extend the rule:

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n} = \frac{b^n}{a^n}$$

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Practice time....

Evaluate (Leave answers in fractional form):

a) $2^0 = 1$ b) $(-2)^4 = 16$ c) $-2^4 = -16$ d) $(-3)^5 = -243$

e) $2^{-4} = \frac{1}{2^4} = \frac{1}{16}$ f) $-2^{-4} = \frac{1}{-2^4} = -\frac{1}{16}$ g) $-3^0 = -1$ h) $3^{-2} = \frac{1}{9}$

Simplify:(write as a single power with positive exponents)

a) $\left((4^3)^{-2}\right)^{-1}$

$= 4^6$

b) $\frac{\left((3^{-1})^{-2}\right)^{-1}}{3(3)^2}$

$= \frac{3^{-2}}{3^3}$

$= 3^{-5}$

$= \frac{1}{243}$

c) $\left(\frac{(4^3)^2}{4(4^6)}\right)^{-1}$

$= \left(\frac{4^6}{4^7}\right)^{-1}$

$= \left[4^{-1}\right]^{-1}$

$= 4$

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Simplify: answer should positive exponents; leave in fractional form

a) $= 5^{-4}\left(5^{-2}\right)^{-1}$

$= 5^{-4}\left(5^2\right)$

$= 5^{-2}$

$= \frac{1}{25}$

b) $\left(\frac{2}{5}\right)^{-3} \times \left(\frac{2}{5}\right)^4 \div \left(\frac{2}{5}\right)^{13}$

$= \left(\frac{2}{5}\right)^1 \div \left(\frac{2}{5}\right)^{13}$

$= \left(\frac{2}{5}\right)^{-12} \rightarrow = \left(\frac{5}{2}\right)^{12}$

Evaluate:

a) $3^{-2} - 2^{-3}$

$= \frac{1}{3^2} - \frac{1}{2^3}$

$= \frac{1 \times 8}{9 \times 8} - \frac{1 \times 9}{8 \times 9}$

$= \frac{8}{72} - \frac{9}{72}$

$= -\frac{1}{72}$

b) $\left(\frac{1}{2}\right)^{-3} + \left(\frac{1}{4}\right)^{-1} - 5^0$

$\left(\frac{2}{1}\right)^3 + \left(\frac{4}{1}\right)^1 - 1$

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Determine the value of the variable that make each of the following true:

a) $10^x = 10000000$ Hint: count the zeros

b) $3^n = \frac{1}{3}$

$n = -1$

c) $10^y = 0.00000001$ Hint: small number you need a neg exponent remember your base is 10 the decimal needs to move one more space the number of zeros after the decimal

d) $8^m = \frac{1}{64}$

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Simplify each expression, answer with positive exponents

a) $\frac{y^{-4}\left(x^2\right)^{-3}y^{-3}}{x^{-5}\left(y^{-4}\right)^2}$

b) $\frac{x^{-3}\left(y^{-1}\right)^{-2}}{\left(x^{-5}\right)\left(y^4\right)}$

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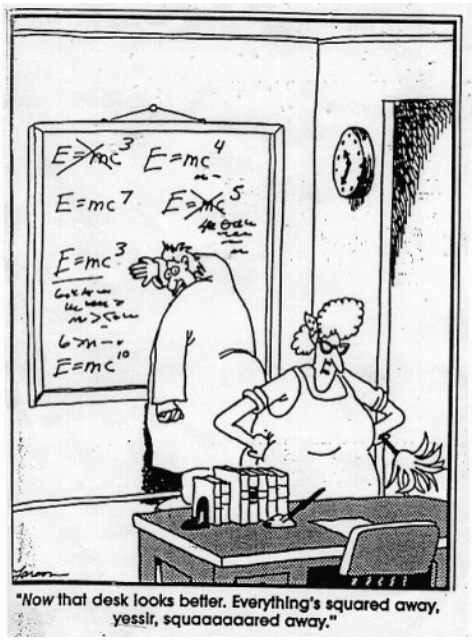
Hmwk:
p 408 # 4, 5 cdef,
6, 7, 9, 11 adf, 12, 13



"Now that desk looks better. Everything's squared away, yessir, squaaaaaared away."

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